Patent
Attorney's Docket No. MP0096

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Examiner: Joseph D. TORRES
Pantas SUTARDJA, et al.	Group Art Unit: 2133
Application No.: 10/074,747	Appeal No. _____
Filed: February 11, 2002	Confirmation No.: 9964
For: ENCODING AND DECODING APPARATUS AND METHOD WITH HAMMING WEIGHT ENHANCEMENT	Date: July 18, 2005

BRIEF FOR APPELLANT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal is from the decision of the Patent Examiner dated April 26, 2005, finally rejecting Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180, which are reproduced as an Appendix to this Appeal Brief.

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02 FC:1402 500.00 OP

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I. Real Party in Interest

The entire interest in the present application, and the invention to which it is directed, is assigned to Marvell International Ltd., as recorded in the Patent and Trademark Office at Reel 012602, Frame 0737.

II. Related Appeals and Interferences

The Appellants' legal representative and assignee do not know of any other appeals or interferences which will directly affect, or be directly affected by, or have a bearing on the Board's decision in this Appeal.

III. Status of Claims

The present application contains claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180, all of which are currently pending. Claims 11-23, 34-37, 48-64, 75-87, 98-101, 112-117, 138-154, and 165-170 have been canceled. Claims 11-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 form the basis for this Appeal.

IV. Status of Amendments

No amendments or responses were filed subsequent to final rejection.

V. Summary of the Invention

The present invention relates generally to encoding and decoding for data transfer and, more particularly, to a method and apparatus for use in encoding and/or data by

providing for a Hamming weight enhancement to the data. [*see* present application, page 1, paragraph 0002]

Encoding/decoding systems are commonly used in modern digital communication systems. Data is frequently stored and/or communicated in binary form, that is, as a sequence of binary digits or bits having zero and one values. When such data is communicated or transferred to a storage medium, such as occurs in the operation of, for example, a disk drive, there is a substantial risk of transmission errors (e.g., a one-valued bit being received when a zero-valued bit was transmitted or vice-versa) caused by noise in the communication channel and other factors. These transmission errors are especially significant when data compression techniques are used to reduce the number of bits needed to communicate a particular message (e.g., in a disk drive or, more generally, in a communication channel), because a single erroneous bit in a compressed message can result in corruption of a larger amount of information in the message after the message is decompressed.

Figure 1 illustrates an example of a conventional write-channel encoder apparatus for encoding information for communication via a channel (or for storage on any suitable media). As illustrated, an encoder 18 receives user data 20 and sequentially performs error correction coding (ECC) (block 22), run length limit (RLL) encoding (block 24), and precoding (block 26) on the user data 20 to thereby produce encoded data which is then written to any suitable media and/or any suitable communication channel (block 28).

An inverse process for decoding the information encoded by the encoder 18 of Figure 1 is performed by a conventional read-channel decoding apparatus such as the decoder 29 illustrated in Figure 2. Initially, the decoder 29 reads or retrieves encoded information from a media source or a communication channel (block 30) and performs a maximum likelihood sequence detection (MLSD) on that encoded information (block 32).

The read-channel decoder 29 then performs reversed precoding on the detected data sequence (block 34) followed by RLL decoding (block 36) and ECC decoding (block 38) to

thereby derive user data 40, which corresponds to the user data 20 encoded by the encoder 18 (Figure 1).

The use of the RLL decoder as shown in Figures 1 and 2, however, causes small errors to be propagated into many symbols of error in the decoded message. The number of symbol errors that can be fixed by the ECC is limited by design. Consequently, the RLL decoding used conventional approaches degrades the final error rate of the data recovery process. One possible solution to this problem has been to reduce the size of the actual encoded word to minimize the maximum possible size for error propagation. In the most extreme case, only one symbol is encoded, and the rest of the symbols in the code word are left unencoded. The advantage of such a simple encoding scheme is in the reduced error propagation after RLL decoding and thus the total number of symbols that can be corrupted by a single error event. As a consequence, such an encoding scheme allows for an increase in the total number of error events the ECC can correct. A significant disadvantage of this scheme is that the smaller encoded symbol makes the minimum Hamming weight of the total code word very small (i.e., equal to the Hamming weight of the single encoded symbol). Codes with high Hamming weight typically provide more signal transitions that can be used for the timing and gain loops. Codes with very low Hamming weight may not provide adequate timing and gain gradients for the channel to provide correct sampling phase and gain control.

To mitigate this problem, the storage industry has used data-scrambling technique (randomizer) to minimize the probability of creating a large number of zeros in the user symbols. Unfortunately, this technique merely makes it more difficult for an end-user to locate a bad data sequence. This randomizer technique is therefore less than satisfactory.

Another conventional method of mitigating such problems is to permute or reverse the ECC and RLL encoders in the "write" process to prevent or at least reduce error propagation, such as illustrated in Figures 3 and 4. In such an encoding scheme, the ECC would correct on the data before RLL decoding, thereby completely avoiding the error propagation effect of RLL decoding. This method of recording and data recovery allows

RLL code to be designed in such a way as to optimize for Hamming weights and thereby improve the performance of the timing and gain loops of the channel.

The encoding scheme shown and described in reference to Figures 3 and 4, however, has certain drawbacks due to compatibility issues that arise from the way in which storage devices that employ these encoding schemes are traditionally certified. Traditionally, technical customers of mass storage device often test the ECC capability of a given mass storage device before deciding to purchase the device. A common method of performing such a test involves so-called "read-long" and "write-long" processes.

These read-long and write-long instructions provide a means for the technical user to verify that the drive indeed has the specified error correction capability before deciding to purchase the drive. A problem with the permuted ECC/RLL scheme is that one corrupted symbol can generate a large number of encoded symbols that are corrupted, assuming that the RLL encoder used is the one that is optimized for the timing and gain loops of the channel. Thus, the conventional read-long and write-long test method will produce a result that appears to suggest that the ECC performance of the drive is vastly inferior to what is claimed by the manufacturer, and a technical customer may decline to purchase the drive because of this adverse test result. This, in turn, will cause the manufacturer of the drive to lose market share to other manufacturers that do not incorporate ECC/RLL permutation. For this reason, the permuted ECC/RLL scheme may not be readily accepted in the storage industry.

Thus, the conventional solutions for transmitting data from one device to another each include significant drawbacks that either increase the costs of manufacturers, or reduce the efficiency of the operating systems.

In contrast, exemplary embodiments of the present invention provide a system and method to improve the error-correction performance of an encoding/decoding scheme. For example, according to an exemplary embodiment, data is encoded using codes with small error propagation to enhance the effectiveness of the error correction coding (ECC) process. Because such codes generally have very low Hamming weights, a secondary encoding scheme is used to enhance the Hamming weights of the codes while maintaining minimal

loss in code rate. The secondary encoding scheme provided according to exemplary embodiments improves the overall Hamming weight of the data sector to be communicated or stored without requiring successful scrambling. In accordance with the principles of the present invention, the secondary encoding scheme can employ a Hamming weight encoder to enhance the Hamming weight of the data to be encoded prior to error correction coding of that data. Also in accordance with the principles of the present invention, the symbol boundary of an encoded symbol advantageously may be left unchanged relative to the error correction coding. [*see* present application, page 17, paragraph 0043]

More particularly, exemplary embodiment of the present invention employ an enhancement to the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes. [*see* present application, page 9, paragraph 0019] According to an aspect of the present invention, such as recited in independent claim 1 of the present application, initial binary data to be communicated or stored is obtained. The characteristic Hamming weight of the initial binary data is determined. The characteristic Hamming weight of the initial binary data is then compared with a predetermined value. The initial binary data is processed based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. The characteristic Hamming weight of the initial binary data can be determined by counting one-valued bits in the initial binary data, and the predetermined value can be a predetermined minimum Hamming weight threshold value. Processing of the initial binary data can comprise, for example, bitwise inverting of the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value. [*see* present application, page 9 – page 10, paragraphs 0020 – 0021]

According to a further exemplary embodiment of the present invention, as recited in, for example, independent claim 24, a method of communicating data from a source to a destination via a channel includes the steps of: obtaining initial binary data having a characteristic Hamming weight at the source; determining the characteristic Hamming weight of the initial binary data; performing a comparison of the characteristic Hamming weight of

the initial binary data with a predetermined value; processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data; conveying the processed binary data from the source to the destination via the channel; and receiving the processed binary data from the source at the destination and regenerating the initial binary data from the processed binary data. [*see* present application, paragraphs 0044-0049]

According to another aspect of the present invention, as recited in, for example, independent claim 38, a communication encoding apparatus includes a data input for receiving initial binary data 80 having a characteristic Hamming weight, and a processor in communication with the data input. [*see* present application, paragraph 0053] The processor is configured to determine the characteristic Hamming weight of the initial binary data. The processor is configured to perform a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value. The processor is also configured to process the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. [*see* present application, paragraphs 0047-0049]

According to another exemplary embodiment of the present invention, as recited in, for example, independent claim 65, a computer-readable medium has stored thereon a first set of machine-executable instructions for obtaining initial binary data having a characteristic Hamming weight. The computer-readable medium has stored thereon a second set of machine-executable instructions for determining the characteristic Hamming weight of the initial binary data. The computer-readable medium also has stored thereon a third set of machine-executable instructions for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and a fourth set of machine-executable instructions for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. [*see* present application, paragraphs 0047-0049]

According to another exemplary embodiment of the present invention, for example, as recited in independent claim 88, a computer-readable medium has stored thereon machine-executable instructions for communicating data from a source to a destination via a channel. [*see* present application, paragraph 0053] The machine-executable instructions include a first set of machine-executable instructions for obtaining initial binary data having a characteristic Hamming weight at the source. The machine-executable instructions include a second set of machine-executable instructions for determining the characteristic Hamming weight of the initial binary data. The machine-executable instructions include a third set of machine-executable instructions for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value. The machine-executable instructions further include a fourth set of machine executable instructions for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data, and a fifth set of machine-executable instructions for conveying the processed binary data from the source to the destination via the channel. [*see* present application, paragraphs 0044-0049]

According to a further aspect of the present invention, as recited in, for example, independent claim 102, a disk drive includes a data input for receiving initial binary data having a characteristic Hamming weight. [*see*, present application, paragraph 0053] The disk drive includes a processor in communication with the data input. The processor is configured to determine the characteristic Hamming weight of the initial binary data. The processor is configured to perform a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value. The processor is also configured to process the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. [*see*, present application, paragraphs 0047-0049]

According to an additional exemplary embodiment of the present invention, as recited in, for example, independent claim 171, a communication encoding apparatus includes an

input for obtaining initial binary data having a characteristic Hamming weight. The apparatus includes a Hamming weight calculator for determining the characteristic Hamming weight of the initial binary data, and a comparator for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value. The apparatus includes a processor for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. [*see* present application, paragraphs 0047-0049]

Independent claim 118 of the present application recites the feature of "obtaining means for obtaining initial binary data having a characteristic Hamming weight." For purposes of illustration, the structure described in the specification as corresponding to the claimed function can be shown as, for example, a receiver, such as, for example, receiver 80 illustrated in Figure 5, and described at page 18, paragraph 0044.

Independent claim 118 of the present application recites the feature of "determining means for determining the characteristic Hamming weight of the initial binary data." For purposes of illustration, the structure described in the specification as corresponding to the claimed function can be shown as, for example, an encoder, such as, for example, a hamming weight encoder 82, illustrated in Figure 5, and described at page 19, paragraph 0047.

Independent claim 118 of the present application recites the features of "comparing means for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value." For purposes of illustration, the structure described in the specification as corresponding to the claimed function can be shown as, for example, an encoder, such as, for example, a hamming weight encoder 82, illustrated in Figure 5, and described at page 19, paragraph 0047.

Independent claim 118 of the present application recites the features of "processing means for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." For purposes of illustration, the structure described in the

specification as corresponding to the claimed function can be shown as, for example, an encoder, such as, for example, a hamming weight encoder 82, illustrated in Figure 5, and described at page 19, paragraph 0047.

Independent claims 128 and 155 of the present application recite the features of "receiving means for receiving initial binary data having a characteristic Hamming weight." For purposes of illustration, the structure described in the specification as corresponding to the claimed function can be shown as, for example, a receiver, such as, for example, receiver 80 illustrated in Figure 5, and described at page 18, paragraph 0044.

Independent claims 128 and 155 of the present application recite the features of "processing means in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." For purposes of illustration, the structure described in the specification as corresponding to the claimed functions can be shown as, for example, an encoder, such as, for example, a hamming weight encoder 82, illustrated in Figure 5, and described at page 19, paragraph 0047.

VI. Grounds of Rejection to be Reviewed on Appeal

The final Office Action presents 17 grounds of rejection for review in this Appeal:

1. Claims 1, 38, 118, 128, and 171 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being incomplete for omitting essential elements, such omission amounting to a gap between the elements.

2. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 stand finally rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements.

3. Claims 10, 33, 47, 74, 97, 111, 127, 137, 164, and 180 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being incomplete for omitting essential elements, such omission amounting to a gap between the elements.

4. Claims 65 and 88 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being incomplete for omitting essential elements, such omission amounting to a gap between the elements.

5. Claims 102 and 155 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being incomplete for omitting essential elements, such omission amounting to a gap between the elements.

6. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Appellants regard as the invention.

7. Claims 65 and 88 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Appellants regard as the invention.

8. Claims 1-10, 118-137, and 155-164 stand finally rejected under 35 U.S.C. §101 as allegedly being directed towards non-statutory subject matter.

9. Claims 65-74 and 88-97 stand finally rejected under 35 U.S.C. §101 as allegedly being directed towards non-statutory subject matter.

10. Claims 1-3, 24-26, 38-40, 65-67, 88-90, 102-104, 118-120, 155-157, and 171-173 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari et al. (U.S. Patent No. 6,456,208 hereinafter "Nazari").

11. Claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

12. Claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

13. Claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

14. Claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

15. Claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

16. Claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

17. Claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180 stand finally rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Nazari.

VII. Arguments

A. Summary of the Arguments

For the convenience of the Board, a summary of Appellants' arguments in response to the aforementioned grounds of rejection is provided below. The following arguments are discussed in greater detail in Sections VII.B - VII.E.

1. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §112, Second Paragraph, as Allegedly Being Incomplete for Omitting Essential Elements, Such Omission Amounting to a Gap Between the Elements.

a. Claims 1, 38, 118, 128, and 171.

The Patent Office questions "how the limitations in the body of the claim are related to the communication encoding." The Patent Office has failed to interpret the claims in light of the disclosure. The Appellants have pointed to specific areas in the specification that support the claims as drafted. The Patent Office asserts that since the preamble of the claims recite a communication encoding apparatus, an "encoded output" must be explicitly recited in the claims. The Appellants note that each of the aforementioned claims recites the elements or step of "processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." Thus, processed binary data is being developed or otherwise produced according to the steps or features of the claims, and the Patent Office is simply ignoring recited features in the claims. Further, it is well known that the applicant need not recite every feature of the invention in the claims. The Patent Office provides no law or rule, no section of the M.P.E.P. to support such an assertion.

b. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171.

The Patent Office alleges that the phrase "based on" is indefinite, because it allegedly "omits essential elements necessary to define the relationship between the processing and the comparison." [final Office Action, page 5] It is respectfully submitted that the Patent Office is completely and utterly failing to interpret the claims in light of the disclosure, in derogation of the requirements of 35 U.S.C. § 112, second paragraph. Specifically, the Appellants assert that certain sections of the specification support and provide a relationship between "the processing and comparison," as recited in the aforementioned claims. In addition, it is respectfully noted that the U.S. Patent and Trademark Office has granted approximately 298,202 patents that include the phrase "based on" in their claims.

c. Claims 10, 33, 47, 74, 97, 111, 127, 137, 164, and 180.

The Patent Office alleges that these claims allegedly omit essential elements or steps, particularly "how a symbol boundary relates to any of the other data structures such as 'initial binary data.'" [First Office Action, page 5] The Patent Office further asserts that the phrase "does not change relative" is allegedly indefinite. In regard to the former, the Appellants direct the Patent Office to portions of the specification that support the claim language, thus fulfilling the requirements of M.P.E.P. §2173.02. Further, the Patent Office asserts that the phrase "relative to" is indefinite. Respectfully, the Appellants note that nearly 450,00 patents have been issued with the phrase "relative to," and that its meaning can be ascertained in view of the specification, as required by law and the M.P.E.P. §2173.02.

d. Claims 65 and 88.

The Patent Office appears to mistakenly apply the requirements of 35 U.S.C. §101 by asserting that there is "no indication that the computer program set forth in the body of the claims provides any *useful* work for the computer readable medium computer program."

Further, as required by the M.P.E.P. §2106, the claims must be reviewed in view of the specification, and as one of ordinary skill in the art would interpret them. Still further, the Appellants submit that the storage of the executable instructions creates a "structural and functional interrelationship between the data structure, computer software and hardware components that permits the data structure's functionality to be realized." [M.P.E.P. §2106]

e. Claims 102 and 155.

The Patent Office specifically asserts that these claims do not show "how the limitations of the body of the claim are related to communication encoding." The Appellants point to specific claim language that, when read in light of the specification, appraises one of ordinary skill in the art of the invention the meaning of the claims. Still further, the Appellants note that the claims do not need to recite "every element of feature of the invention . . ."

2. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §112, Second Paragraph, as Allegedly Being Indefinite for Failing to Particularly Point Out and Distinctly Claim the Subject Matter Which the Appellants Regard as the Invention.

a. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171.

The Patent Office alleges that the phrase "based on" is indefinite. In this instance, the Patent Office provides no basis for such an assertion. The Appellants note that the requirements of M.P.E.P. §2173.02 have been met in that "the test for definiteness under 35 U.S.C. § 112, second paragraph, is whether 'those skilled in the art would understand what is claimed when the claim is read in light of the specification.'"

b. Claims 65 and 88.

Claims 65 and 88 stand finally rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Appellants regard as the invention. The Appellants respectfully submit that the rejection of claims 65 and 88 under 35 U.S.C. §112, second paragraph is in error. This rejection is essentially the same as was made previously of these claims, and as such the arguments previously presented by the Appellants apply here as well.

3. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §101, Because the Claimed Invention is Allegedly Directed To Non-Statutory Subject Matter.

a. Claims 1-10, 118-137, and 155-164.

The Patent Office alleges that these claims recite "an abstract algorithm that can be carried out by hand with no link to any tangible process, machine, manufacture, or composition of matter." [Final Office Action, page 8] The Appellants submit that the claimed invention produces a "useful, tangible, and concrete result." The Appellants point to several examples in the M.P.E.P. that support their position that the claims meet the statutory requirements of utility. For example, the Appellants point out that the aforementioned claims accomplish, *inter alia*, "the development of processed binary data."

b. Claims 65-74 and 88-97.

Each of these claims recites, or depends from an independent claims that recites, a computer readable medium "having stored thereon" executable instructions. As such, each claim meets the requirements as discussed in M.P.E.P. §2106 in that "[w]hen functional descriptive material is recorded on some computer-readable medium it becomes structurally

and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized." [M.P.E.P. § 2106]

4. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §102(e), as Allegedly Being Anticipated by Nazari.

a. Claims 1-3, 24-26, 38-40, 65-67, 88-90, 102-104, 118-120, 155-157, and 171-173.

These claims recite the features of determining the characteristic Hamming weight of the initial binary data, and performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value. Nazari does not teach or suggest either claim feature. Nazari teaches the determination of dividing a codeword into four groups, and each is compared to a look-up table. If the sub-divided group is in the look-up table, a four bit replacement for that eight but word is selected. In no event does Nazari teach or suggest the determination of the characteristic Hamming weight of the *initial* binary data.

b. Claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174.

These claims recite that the feature of processing the initial binary data comprises bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value. The Appellants submit that Nazari fails to teach or suggest such features.

c. Claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175.

These claims recite that the feature of processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value. The Appellants submit that Nazari fails to teach or suggest such features.

d. Claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176.

These claims recite the feature that the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise. The Appellants submit that Nazari fails to teach or suggest such features.

e. Claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177.

These claims recite the feature of supplying an indication of whether bits of the processed binary data are inverted. The Appellants submit that Nazari fails to teach or suggest such features.

f. Claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178.

These claims recite the feature that the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise. The Appellants submit that Nazari fails to teach or suggest such features.

g. Claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179.

These claims recite the feature that the processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding. The Appellants submit that Nazari fails to teach or suggest such features.

h. Claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180.

These claims recite the feature that a symbol boundary of an encoded symbol does not change relative to error correction coding. The Appellants submit that Nazari fails to teach or suggest such features.

B. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §112, Second Paragraph, as Allegedly Being Incomplete for Omitting Essential Elements, Such Omission Amounting to a Gap Between the Elements.

It is respectfully submitted that the rejection of claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 under 35 U.S.C. §112, second paragraph, is totally and wholly without merit, and as such, the Appellants respectfully that this rejection should be withdrawn.

1. Claims 1, 38, 118, 128, and 171.

The Appellants respectfully submit that the rejection of claims 1, 38, 118, 128, and 171 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office alleges that certain elements are omitted from the aforementioned claims, in particular, "how the limitations in the body of the claim are related to the communication encoding." [First Office Action, page 5] However, according to M.P.E.P. § 2106,

> Applicant's claims, interpreted in light of the disclosure, must reasonably apprise a person of ordinary skill in the art of the invention. However, the applicant *need not explicitly recite* in the claims every feature of the invention. For example, if an applicant indicates that the invention is a particular computer, the claims do not have to recite every element or feature of the computer. In fact, it is preferable for claims to be drafted in a form *that emphasizes what the applicant has invented* (i.e., what is new rather than old). [M.P.E.P. § 2106 (citations omitted) (emphasis added)]

It is respectfully submitted that the Appellants have recited claims that emphasize what the Appellants have invented. For example, it is noted that claim 1 recites a communication encoding method that includes the steps of: obtaining initial binary data having a characteristic Hamming weight; determining the characteristic Hamming weight of

the initial binary data; performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

Additionally, it is respectfully submitted that such an allegation by the Patent Office clearly evinces a complete and total failure by the Patent Office to interpret the claims in light of the disclosure. For example, the present application clearly discloses that "the present invention employs an enhancement to the Hamming weight of the data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes." [present application, page 9, paragraph 0019] More particularly,

> [t]he present invention provides one approach to improving the error-correction performance of an encoding/decoding scheme. Preferably, data is encoded using codes with small error propagation to enhance the effectiveness of the error correction coding (ECC) process. However, such codes generally have very low Hamming weights, such that a secondary encoding scheme is needed to enhance the Hamming weights of the codes while maintaining minimal loss in code rate. Such a secondary encoding scheme must improve the overall Hamming weight of the data sector to be communicated or stored without requiring successful scrambling. In accordance with the principles of the present invention, this secondary encoding scheme may employ a Hamming weight encoder to enhance the Hamming weight of the data to be encoded prior to error correction coding of that data. [present application, page 17 – page 18, paragraph 0043]

Thus, it is respectfully submitted that a skilled artisan would recognize "how the limitations in the body of the claim are related to the communication encoding" when the claims are read in light of the disclosure. Accordingly, claims 1, 38, 118, 128 and 171 of the present application "reasonably apprise a person of ordinary skill in the art of the invention."' It is respectfully submitted that claims 1, 38, 118, 128 and 171 do not omit any essential element or step. Rather, it is respectfully submitted that the Patent Office is misunderstanding, misinterpreting and mischaracterizing both the aforementioned claims and the tenets and requirements of the patent laws.

It is to be noted that an interview was conducted to resolve this issue. During the interview, the Patent Office clarified its position. The Patent Office asserted that since the preamble of these claims recite a communication encoding method or apparatus, the Patent Office is requiring an "encoded output" to be explicitly recited in the claims, i.e., the output of an *entire* encoding process. First, Appellants respectfully note that each of the aforementioned claims recites the element or step of "processing the initial binary data based on the comparison *to thereby develop processed binary data* having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." Thus, *processed binary data* is being developed or otherwise produced according to the steps or features of the claims. It is respectfully submitted that the Patent Office is simply ignoring recited features in the claims.

Additionally, "the applicant need not explicitly recite in the claims every feature of the invention. For example, if an applicant indicates that the invention is a particular computer, the claims do not have to recite every element or feature of the computer. In fact, it is preferable for claims to be drafted in a form that emphasizes what the applicant has invented (i.e., what is new rather than old)." [M.P.E.P. § 2106 (citations omitted) (emphasis added)] It is respectfully submitted that the Appellants have recited claims that emphasize that which has been invented. To require the Appellants to recite each and every step or element in the entire encoding process would require Appellants to recite in the claims that which is old. No such requirement exists under the patent laws, and the Patent Office has provided no support or basis for its untenable position.

In particular, the Appellants respectfully requested that the Patent Office point out the precise law and/or rule, the exact section of the M.P.E.P., as well as the sentences within that section relied upon to support the Patent Office's unfounded requirement. It is respectfully noted that not only was such request not honored, the Patent Office merely reiterated its previous rejection in the Final Office Action. [*see* Final Office Action, pages 2 and 3]

Furthermore, the Patent Office provided the following unfounded assertion: "The Applicant admits that the claim fails to point out and distinctly claim the subject matter which

applicant regards as the invention and that one of ordinary skill in the art at the time the invention was made would have to read the specification to make that determination.: [Final Office Action, page 3] Respectfully, such an assertion is completely and totally without merit and is utterly baseless in fact. The Patent Office did not provide a direct quote or even a section that suggests such an inference, because the Appellants have made no such statement or any comment that could be interpreted thusly. The Appellants respectfully request that the Patent Office retract such a baseless and unfounded assertion.

The Patent Office disagrees with the Appellants assertion that, "to require the Applicants to recite each and every step or element in the entire encoding process would require Applicants to recite in the claims that which is old. No such requirement exists under patent laws." [Final Office Action, page 3]. The Patent Office disagrees, but does not rise to the challenge by pointing to any decision by a competent court, or section of the M.P.E.P., that supports the Patent Office's statement. The Appellants again refer to M.P.E.P. § 2106 to support their assertion in regard to whether the claims need to recite that which is old in the art.

Further, the Patent Office states that "the requirement of 35 U.S.C. §112 [second paragraph] is that the claim itself particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1, for example [sic] recites a communication encoding method but does not recite any step that gives[s] any indication what connection the body of claim 1 has with a communication encoding method." [Final Office Action, page 3] The Patent Office appears to be making the statement that the body of the claim *must* include some reference, some overt, concrete recitation between the preamble of the claim and the body of the claim in order for it to be a valid claim in regard to 35 U.S.C. §112, second paragraph. Yet, the Patent Office provides *absolutely no support* for such a requirement. As discussed above, each of the aforementioned claims recites the element or step of "processing the initial binary data based on the comparison *to thereby develop processed binary data* having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." Thus, *processed binary data* is being developed or otherwise produced

according to the steps or features of the claims. It is respectfully submitted that the Patent Office is simply ignoring recited features in the claims.

For at least the foregoing reasons, the rejection of claims 1, 38, 118, 128, and 171 under 35 U.S.C. §112, second paragraph is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 2-10, 39-47, 119-127, 129-137 and 172-180 variously depend from independent claims 1, 38, 118, 128, and 171, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 1, 38, 118, 128, and 171.

2. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171.

The Appellants respectfully submit that the rejection of claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office alleges that the phrase "based on" is indefinite, because it allegedly "omits essential elements necessary to define the relationship between the processing and the comparison." [final Office Action, page 5] It is respectfully submitted that the Patent Office is completely and utterly failing to interpret the claims in light of the disclosure, in derogation of the requirements of 35 U.S.C. § 112, second paragraph. In addition, it is respectfully noted that the U.S. Patent and Trademark Office has granted approximately *298,202* patents that include the phrase "based on" in their claims. [*see* Exhibit A, attached]

According to M.P.E.P. § 2173.02, "the test for definiteness under 35 U.S.C. § 112, second paragraph, is whether 'those skilled in the art would understand what is claimed *when the claim is read in light of the specification.*'" [M.P.E.P. § 2173.02 (citations omitted) (emphasis added)] If one skilled in the art is able to ascertain the meaning of the terms used in the claim in light of the specification, 35 U.S.C. § 112, second paragraph, is satisfied. [*see* M.P.E.P. § 2173.02] As disclosed by the present application,

> [t]he Hamming weight encoder preferably has knowledge about the data symbols that will not be RLL encoded by the RLL encoder. The user data 80, in the aggregate, is divided into several large groups of symbols. Each group is analyzed, and the total Hamming weight for the portion that is not to be RLL encoded is determined. This total Hamming weight is then compared with a predetermined threshold Hamming weight value (e.g., a value equivalent to 50 percent of the length of the group of bits of the user data 80). If the total Hamming weight is too small (i.e., is less than the predetermined threshold Hamming weight value), then all of the bits in this group are inverted. . . . As will be readily apparent to those of ordinary skill in the art, this procedure ensures that the group of bits of data to be encoded has a Hamming weight that is at least as great as 50% of the size of the group. [present application, page 19, paragraph 0047]

"Breadth of a claim is not to be equated with indefiniteness." [M.P.E.P. § 2173.04] Based on the foregoing, it is respectfully submitted that a skilled artisan would recognize "the relationship between the processing and the comparison" when the claims are read in light of the specification. Since the "scope of the subject matter embraced by the claims is clear, and . . . applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. § 112, second paragraph." [M.P.E.P. § 2173.04] Consequently, it is respectfully submitted that the term "based on" is not indefinite, as "those skilled in the art would understand what is claimed when the claim is read in light of the specification."

The Patent Office, in its Final Office Action, asserts that "*undue experimentation* would be required of one of ordinary skill in the art at the time of the invention was made to recognize the relationship the recited paragraph [0047] has with the claim language since the recited paragraph does not even refer to initial binary data and processed binary data." [Final Office Action, page 4 (emphasis added)] As a first matter, the Patent Office's use of the phrase "undue experimentation" is troubling, because this phrase is used in conjunction with a rejection made under 35 U.S.C. §112, *first* paragraph, the enablement requirement. The Patent Office, however, has not overtly or expressly rejected these claims under 35 U.S.C. §112, first paragraph, and therefore, the Appellants cannot properly respond. The Patent Office cites none of the following known factors to support a determination that a disclosure

does not satisfy the enablement requirement and whether any necessary experimentation is "undue." These factors include, but are not limited to: the breadth of the claims; the nature of the invention; the state of the prior art; the level of one of ordinary skill; the level of predictability in the art; the amount of direction provided by the inventor; the existence of working examples; and the quantity of experimentation needed to make or use the invention based on the content of the disclosure. Since the Patent Office has not clearly stated why and in what context it is using the phrase "undue experimentation" in reference to the rejection under 35 U.S.C. §112, second paragraph, the Appellants cannot be expected to discuss this aspect with anything other than a general understanding of what the Patent Office *might* have been trying to evoke. As discussed above, the Appellants respectfully submit that one skilled in the art of the invention would understand "what is claimed when the claim is read in light of the specification." Therefore, the Patent Office is directed to refer to paragraphs 0044 which describes the encoding apparatus 79 as receiving user data 80 that comprises a stream of binary digits or bits of information, and paragraph 0053, which discloses the use of "an encoder [according to an embodiment of the present invention] in general purpose computers . . . processor-to-processor applications, [as well as being] incorporated directly into a computer motherboard . . ." [*see* present application, paragraph 0053]

Finally, the Patent Office asserts that the Appellants' "arguments are incomplete since the Applicant has failed to point out the relationship between initial binary data and processed binary data used in the claim language and any of the data elements recited in paragraph [0047] on page 19." [Final Office Action, page 4] Respectfully, the Appellants fail to see any merit whatsoever in this statement of the Patent Office. The Patent Office, in its first Office Action, merely asserted that "[t]he term 'based on' is indefinite since it omits essential elements necessary to define the relationship *between the processing and the comparison*." [First Office Action, page 5, emphasis added] As discussed herein, it is respectfully submitted that one skilled in the art of the present invention can glean the relationship between initial binary data, and processed binary data, for example, from paragraphs 0047 through 0053, and elsewhere in the specification.

For at least the foregoing reasons, it is respectfully submitted that the rejection of claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 under 35 U.S.C. §112, second paragraph is in error, and the Appellants respectfully request that the rejection be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

3. Claims 10, 33, 47, 74, 97, 111, 127, 137, 164, and 180.

The Appellants respectfully suggest that the rejection of claims 10, 33, 47, 74, 97, 111, 127, 137, 164, and 180 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

With regard to the phrase "wherein a symbol boundary of an encoded symbol does not change relative to error correction encoding," the Patent Office asserts that the aforementioned claims allegedly omit essential elements or steps, particularly "how a symbol boundary relates to any of the other data structures such as 'initial binary data.'" [First Office Action, page 5] The Patent Office further asserts that the phrase "does not change relative" is allegedly indefinite. It is respectfully submitted that the Patent Office is once again completely and utterly failing to interpret the claims in light of the disclosure.

For example, dependent claim 9, which depends from independent claim 1, recites the step of "processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding." Thus, the step of processing the initial binary data to develop processed binary data can include one or more of the steps of error correction coding, run-length encoding, and precoding. Dependent claim 10, which depends from claim 9, recites that "a symbol boundary of an encoded symbol does not change relative to error correction coding." According to an exemplary embodiment of the present invention, "the symbol boundary of an encoded symbol advantageously may be left unchanged relative to the error correction coding." [present application, page 18, paragraph 0043] Thus, according to one exemplary embodiment, the error correction coding does not change the symbol boundary of an encoded symbol.

Based on the foregoing, it is respectfully submitted that a skilled artisan would recognize "how a symbol boundary relates to any of the other data structures such as 'initial binary data'" when the claim is read in light of the specification. In particular, a skilled artisan would recognize that the symbol boundary recited in claim 10 refers to an encoded symbol, not initial binary data as asserted by the Patent Office, because the initial binary data is processed by one or more of the steps of error correction coding, run-length encoding and pre-coding as recited in dependent claim 9. Since the "scope of the subject matter embraced by the claims is clear, and . . . applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. § 112, second paragraph." [M.P.E.P. § 2173.04]

Consequently, it is respectfully submitted that aforementioned claims do not omit any essential elements or steps, and that the term "does not change relative to" is not indefinite, as "those skilled in the art would understand what is claimed when the claim is read in light of the specification."

The Patent Office still maintains, in the Final Office Action, that the language "'wherein a symbol boundary of an encoded symbol does not change relative to error correction coding' is still indefinite. The term 'relative to' is indefinite." Respectfully, if the term "relative to" is indefinite, then the Patent Office has mistakenly issued almost 450,000 patents with claims that contain the term "relative to." [*see* Exhibit B, attached]

The Patent Office then asserts that:

> [a]n encoded signal is just an encoded signal. If the boundary of the encoded symbol changed it would not be the same encoded symbol. The language does not specify any action or give any reason why a change could be anticipated. Given that no action takes place, one of ordinary skill in the art at the time the invention was made would expect nothing to happen. Basically the language adds nothing. [Final Office Action, pages 5]

The Appellants respectfully wonder what point the Patent Office is making with the above paragraph: There is no cognizable rejection, or even an assertion that the Appellants' arguments are incorrect, or a suggestion of a theory that refutes what the Appellants have

offered in their response to the First Office Action. The passage, it appears, is more a commentary on the efficacy of the Appellants process and their claimed invention. Such an inquiry and review is so contrary to established accepted patent law, no citation is necessary. The Appellants respectfully request that the Patent Office retract such a baseless and unfounded assertion.

For at least the foregoing reasons, the rejection of claims 10, 33, 47, 74, 97, 111, 127, 137, 164, and 180 under 35 U.S.C. §112, second paragraph is in error, and it is respectfully requested that the rejection be withdrawn.

Dependent claims 2-10, 25-33, 39-47, 66-74, 89-97, 103-111, 119-127, 129-137, 156-164 and 172-180 variously depend from independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171.

Hence, the subject matter of these claims is separately patentable for this reason.

4. Claims 65 and 88.

The Appellants respectfully submit that the Patent Office rejection of claims 65 and 88 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office asserts that there is allegedly "no indication that the computer program set forth in the body of the claims provides any useful work for the computer readable medium; hence the body of the claim are not directed to a computer-readable medium." [Final Office Action, page 5 – page 6]

Once again, it is respectfully noted that the Patent Office is confusing the requirements of the patent laws. The Patent Office asserts that the computer program set forth in the body of the claims does not provide any useful work for the computer readable medium. It is respectfully submitted that "usefulness" or "utility" is a requirement of 35 U.S.C. § 101, which is separate and distinct from the requirements of 35 U.S.C. § 112, second paragraph. Thus, the Patent Office is rejecting these claims under 35 U.S.C. § 112,

second paragraph, but then discussing how the claims are allegedly not showing utility. The Patent Office cannot simply mix and match the requirements of the patent laws at its discretion when examining the claims. Therefore, to help to resolve the confusion on the part of the Patent Office, the Appellants will attempt to address the rejections under the mandates of 35 U.S.C. § 112, second paragraph.

According to M.P.E.P. § 2106, discussing the requirements of 35 U.S.C. § 112, second paragraph, and computer-related inventions, "the definiteness of the language must be analyzed, not in a vacuum, but always in light of the teachings of the disclosure as it would be interpreted by one of ordinary skill in the art. Applicant's claims, interpreted in light of the disclosure, must reasonably apprise a person of ordinary skill in the art of the invention." [M.P.E.P. § 2106 (emphasis added)]

It is respectfully noted that the preamble of claims 65 and 88 recite a computer-readable medium "having stored thereon" the executable instructions recited in the body of the claims. Thus, the computer-readable medium can store the software instructions recited in the body of the claims. In other words, the computer-readable medium recited in the preamble of these claims is used for storage purposes to store the software instructions, as would be recognized by one of ordinary skill in the art. Although the executable instructions stored on the computer-readable medium can be used with other general purpose computers (e.g., disk drives, printers, routers and the like), the executable instructions can also be used in other fields such an Internet communications, telecommunications or any processor-to-processor applications. However, such discussion of "use" is directed to the requirements of 35 U.S.C. § 101, not the requirements of 35 U.S.C. § 112, second paragraph.

Rather, it is respectfully submitted that one of ordinary skill in the art would recognize that the storage of the "functional descriptive material" comprising the executable instructions (recited in the body of independent claims 65 and 88) on the computer-readable media creates "structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized." [M.P.E.P. § 2106] Consequently, it is respectfully submitted that

independent claims 65 and 88 "apprise a person of ordinary skill in the art of the invention." Accordingly, it is respectfully submitted that independent claims 65 and 88 fully comply with the mandates of 35 U.S.C. § 112, second paragraph.

For at least the foregoing reasons, the rejection of claims 65 and 88 under 35 U.S.C. §112, second paragraph is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 66-74 and 89-97 variously depend from independent claims 65 and 88, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 65 and 88.

Hence, the subject matter of these claims is separately patentable for this reason.

5. Claims 102 and 155.

The Appellants respectfully submit that the Patent Office rejection of claims 102 and 105 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office asserts that the disk drives recited in the aforementioned claims allegedly omit essential elements, in particular, "how the limitations of the body of the claim are related to communication encoding." Yet again, it is respectfully submitted that the Patent Office is completely and utterly failing to interpret the claims in light of the disclosure, as required by the mandates of 35 U.S.C. § 112, second paragraph.

For example, claim 102 recites a disk drive that includes a data input for receiving initial binary data having a characteristic Hamming weight. The disk drive also includes a processor in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. As noted in the present application, "[d]isk drives, of course, are well-known in the art, but additional

information and a general circuit arrangement for one exemplary disk drive apparatus may be found, for example, in Wakamatsu U.S. Patent No. 6,011,666." [*see* present application, page 2, paragraph 0003]

As noted in M.P.E.P. § 2106, "[c]laims and disclosure are not to be evaluated in a vacuum. If elements of an invention are well known in the art, the applicant does not have to provide a disclosure that describes those elements." [M.P.E.P. § 2106] It is respectfully submitted that the Appellants have recited claims that emphasize that which has been invented. As disk drives are well-known in the art, it is respectfully submitted that Appellants' claims directed to disk drives "reasonably apprise a person of ordinary skill in the art of the invention," because a skilled artisan would recognize "how the limitations of the body of the claim are related to communication encoding" when the claim is read in light of the specification. Therefore, it is respectfully submitted that independent claims 102 and 155 fully and completely comply with the mandate of 35 U.S.C. § 112, second paragraph.

Additionally, "the applicant need not explicitly recite in the claims every feature of the invention. For example, if an applicant indicates that the invention is a particular computer, the claims do not have to recite every element or feature of the computer. In fact, it is preferable for claims to be drafted in a form that emphasizes what the applicant has invented (i.e., what is new rather than old)." [M.P.E.P. § 2106 (citations omitted)] As noted repeatedly, it is respectfully submitted that the Appellants have recited claims that emphasize that which has been invented. To require the Appellants to recite each and every element of a disk drive would require Appellants to recite in the claims that which is old. No such requirement exists under the patent laws.

In the Final Office Action, the Patent Office respectfully disagrees with the Appellants arguments, and states that "the requirement of 35 U.S.C. § 112 [second paragraph] is that *the claim itself* particularly point out and distinctly claim the subject matter which [the] applicant regards as the invention.[1] Claim 102 (and presumably claim 155) recites a disk drive comprising 'a processor in communication with the data input for

1 "The specification shall conclude with *one or more claims* particularly pointing out and distinctly claiming the subject which the applicant regards as his invention." 35 U.S.C. §112, second paragraph.

determining the characteristic Hamming weight . . .' Such a processor does not exist in the prior art, hence *the disclosure must describe that element.*" [Final Office Action, page 5 (emphasis added)]

Respectfully, the Appellants do not fully comprehend exactly what the argument is that the Patent Office is setting forth: The Patent Office cites 35 U.S.C. §112 [second paragraph] as the basis for the final rejection of claims 102 and 155, yet, asserts that since the processor does not exist in the prior art, "*the disclosure must describe that element.*" It appears that the Patent Office is again confusing the requirements of 35 U.S.C. §112, second paragraph, with other parts of the patent law. Since the Patent Office has not provided any other basis for the final rejection, in regard to the above-quoted portion of the Final Office Action, the Appellants cannot properly respond, other than to the argument made in respect to 35 U.S.C. § 112, second paragraph. The Appellants also wish to express appreciation to the Patent Office for admitting the processor features of claims 102 and 155 are not found in the prior art.

Finally, the Patent Office concludes by admitting that it is true "the applicant need not explicitly recite in the claims every feature of the invention." [Final Office Action, page 6] The Patent Office then utterly mischaracterizes the Appellants' discussion in the Summary section of the Patent Specification. The Patent Office asserts that:

> [e]ven the Applicant admits on page 9, paragraph [0019] of the Applicant's [sic] disclosure that the Applicant's [sic] invention *is directed to* a method for enhancing the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes, yet nowhere in the independent claims does the Applicant claim any ECC or RLL encoding nor features that relate the ECC or RLL encoding to the features recited in the claims. [Final Office Action, page 6, emphasis added]

Respectfully, as discussed above, the Patent Office is completely and thoroughly mischaracterizing the disclosure of the Appellants. It is the Appellants belief that the Patent Office is referring to the following language from the specification: "More particularly, *the present invention employs* an enhancement to the Hamming weight of data prior to encoding

to increase the effectiveness of the ECC and RLL encoding processes." [Appellants application as filed, paragraph 0019 (emphasis added)] Nowhere does the Appellant state or suggest that the claims of the Appellants' application need to be "directed solely towards a method for enhancing the Hamming weight of data prior to encoding . . ." It is to be noted that Patent Office provides *absolutely no basis whatsoever* for the proposition that the statements the Appellants make in the Summary portion of the specification specifically limit the type of claims that the Appellant is allowed to pursue. It is well known to those with even a *cursory* understanding of patent law that the claims define the "metes and bounds" of the Appellants' invention. As long as each claim is fully supported in the specification, and meet all the statutory and common law requirements for patentability, such claims are allowable. In no way or manner has the Patent Office proffered any explanation of how the Patent Office's above-discussed statement supports a rejection of claims 102 and 155 under 35 U.S.C. § 112, second paragraph. The Patent Office is referred to the following from the M.P.E.P.:

> A rejection based on the failure to satisfy this requirement (focus for examination) is appropriate *only where applicant has stated, somewhere other than in the application as filed, that the invention is something different from what is defined by the claims.* In other words, *the invention set forth in the claims must be presumed*, in the absence of evidence to the contrary, *to be that which applicants regard as their invention. In re Moore*, 439 F.2d 1232, 169 USPQ 236 (CCPA 1971). [M.P.E.P. § 2172 (emphasis added)]

Further, the following paragraph is found on page 6 of the Final Office Action, but its apparent purpose evades the Appellants, as it is not tied to any one specific rejection of assertion by the Patent Office:

> The Applicant contends, 'If this rejection is repeated, the Patent Office is requested to point out the precise law and/or rule, the exact section of the M.P.E.P., as well as the sentences within that section relied upon to support the Patent Office's unfounded requirement'. The Applicant contends, 'The Examiner asserts that 35 U.S.C. § 112 requires that the claims particularly

point and distinctly claim the subject matter **which [the] applicant regards as the invention**." [Final Office Action, page 6, emphasis original]

Respectfully, the Appellants contend they cannot respond to such a statement, as the Patent Office makes no assertion within it, nor has the Patent Office tied it to any specifically made previous argument.

For at least the foregoing reasons, it is respectfully submitted that claims 102 and 155 fully and completely comply with the requirements of 35 U.S.C. § 112, second paragraph. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

Dependent claims 103-111 and 156-164 variously depend from independent claims 102 and 155, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 102 and 155.

Hence, the subject matter of these claims is separately patentable for this reason.

C. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §112, Second Paragraph, as Allegedly Being Indefinite for Failing to Particularly Point Out and Distinctly Claim the Subject Matter Which the Appellants Regard as the Invention.

It is respectfully submitted that the rejection of claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Appellants regard as the invention is totally and wholly without merit, and the Appellants respectfully request that the rejection be withdrawn.

1. Claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171.

The Appellants respectfully submit that the rejection of claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 under 35 U.S.C. § 112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office alleges that the phrase "based on" is indefinite. Initially, Appellants respectfully note that this rejection is a repeat of the rejection posed in section 3, page 5 of the First Office Action, as discussed previously. However, due to the continued evident confusion on the part of the Patent Office regarding the requirements of the patent laws, and the apparent inability on the part of the Patent Office to separate such requirements, the Appellants will again address this supposed rejection.

As discussed previously, it is respectfully submitted that the Patent Office is completely and utterly failing to interpret the claims in light of the disclosure.

According to M.P.E.P. § 2173.02, "the test for definiteness under 35 U.S.C. § 112, second paragraph, is whether 'those skilled in the art would understand what is claimed when the claim is read in light of the specification.'" [M.P.E.P. § 2173.02 (citations omitted)] If one skilled in the art is able to ascertain the meaning of the terms used in the claim in light of the specification, 5 U.S.C. § 112, second paragraph, is satisfied. [*see* M.P.E.P. § 2173.02] As

discussed previously, the disclosure of the present application clearly apprises a skilled artisan of the meaning of the terms used in the claim, particularly with respect to the term "based on." [*see, e.g.*, present application, page 19, paragraph 0047] Again, "[b]readth of a claim is not to be equated with indefiniteness." [M.P.E.P. § 2173.04] Since the "scope of the subject matter embraced by the claims is clear, and . . . applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. § 112, second paragraph." [M.P.E.P. § 2173.04] Consequently, it is respectfully submitted that the term "based on" is not indefinite, as "those skilled in the art would understand what is claimed when the claim is read in light of the specification."

For at least the foregoing reasons, the rejection of claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171 under 35 U.S.C. §112, second paragraph is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 2-10, 25-33, 39-47, 66-74, 89-97, 103-111, 119-127, 129-137, 156-164 and 172-180 variously depend from independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171.

2. Claims 65 and 88.

The Appellants respectfully submit that the rejection of claims 65 and 88 under 35 U.S.C. §112, second paragraph is in error, and respectfully request that the rejection be withdrawn.

The Patent Office again asserts that there is allegedly "no indication that the computer program set forth in the body of the claims provides any *useful* work for the computer readable medium; hence the body of the claim are not directed to a computer-readable medium." [Final Office Action, page 7]

Yet again, it is respectfully noted that the Patent Office is utterly confusing the requirements of the patent laws. The Patent Office asserts that the computer program set forth in the body of the claims do not provide any *useful* work for the computer readable medium. It is respectfully submitted that "usefulness" or "utility" is a requirement of 35 U.S.C. § 101, which is separate and distinct from the requirements of 35 U.S.C. § 112, second paragraph. Thus, the Patent Office is rejecting these claims under 35 U.S.C. § 112, second paragraph, but then discussing how the claims are allegedly not showing utility. As noted previously, the Patent Office cannot simply mix and match the requirements of the patent laws at its whim when examining the claims. Therefore, in a continuing effort to help to resolve the evident confusion on the part of the Patent Office, the Appellants will once again attempt to address the rejections under the mandates of 35 U.S.C. § 112, second paragraph.

According to M.P.E.P. § 2106, discussing the requirements of 35 U.S.C. § 112, second paragraph, and computer-related inventions, "the definiteness of the language must be analyzed, not in a vacuum, but always in light of the teachings of the disclosure as it would be interpreted by one of ordinary skill in the art. Applicant's claims, interpreted in light of the disclosure, must reasonably apprise a person of ordinary skill in the art of the invention." [M.P.E.P. § 2106]

As addressed previously, it is respectfully noted that the preamble of claims 65 and 88 recite a computer-readable medium "having stored thereon" the executable instructions recited in the body of the claims. Thus, the computer-readable medium can *store* the software instructions recited in the body of the claims. In other words, the computer-readable medium recited in the preamble of these claims is used for *storage purposes* to store the software instructions, as would be recognized by one of ordinary skill in the art. Although the executable instructions *stored on* the computer-readable medium can be used with other general purpose computers (e.g., disk drives, printers, routers and the like), the executable instructions can also be used in other fields such an Internet communications, telecommunications or any processor-to-processor applications. However, such discussion of

"use" is directed to the requirements of 35 U.S.C. § 101, not the requirements of 35 U.S.C. § 112, second paragraph.

Rather, as discussed previously, it is respectfully submitted that one of ordinary skill in the art would recognize that the storage of the "functional descriptive material" comprising the executable instructions (recited in the body of independent claims 65 and 88) on the computer-readable media would create "*structural and functional interrelationships* between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized." [M.P.E.P. § 2106] Consequently, it is respectfully submitted that independent claims 65 and 88 "apprise a person of ordinary skill in the art of the invention" when the claims are read in light of the specification.

For at least the foregoing reasons, it is respectfully submitted that independent claims 65 and 88 fully, completely and thoroughly comply with the mandates of 35 U.S.C. § 112, second paragraph. Therefore, the rejection of claims 65 and 88 under 35 U.S.C. §112, second paragraph is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 66-74 and 89-97 variously depend from independent claims 65 and 88, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 65 and 88.

Hence, the subject matter of these claims is separately patentable for this reason.

D. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §101, Because the Claimed Invention is Allegedly Directed To Non-Statutory Subject Matter.

It is respectfully submitted that the rejection of claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 under 35 U.S.C. §101 is totally and wholly without merit, and as such, the Appellants respectfully that this rejection should be withdrawn.

1. Claims 1-10, 118-137, and 155-164.

The Appellants respectfully submit that the rejection of claims 1, 118, 128 and 155 under 35 U.S.C. § 101 is in error, and respectfully request that the rejection be withdrawn.

The Patent Office alleges that the aforementioned claims recite "an abstract algorithm that can be carried out by hand with no link to any tangible process, machine, manufacture, or composition of matter." [Final Office Action, page 8] It is respectfully submitted that the Patent Office has clearly and unequivocally failed to apply the correct test for utility required under 35 U.S.C. § 101.

According to M.P.E.P. § 2106, "[t]he claimed invention as a whole must accomplish a practical application. That is, it must produce a 'useful, concrete and tangible result.'" [M.P.E.P. § 2106 (citations omitted)] Although the courts have yet to define the terms "useful," "concrete," and "tangible" in the context of the practical application requirement, several examples are given in the M.P.E.P. that illustrate claimed inventions that have a practical application, because they produce useful, concrete and tangible results. For example,

> transformation of data, representing discrete dollar amounts, by a machine through *a series of mathematical calculations* into a final share price, constitutes *a practical application of a mathematical algorithm, formula, or calculation*, because it produces "a useful, concrete and tangible result" – a final share price momentarily fixed for recording and reporting purposes and

> even accepted and relied upon by regulatory authorities and in subsequent trades. [M.P.E.P. § 2106 (citing *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368 at 1373, 47 U.S.P.Q.2d 1596 at 1601 (Fed. Cir. 1998)) (emphasis added)]

In particular, a statutory process claim is illustrated as follows:

> [a] digital filtering process for removing noise from a digital signal comprising the steps of *calculating a mathematical algorithm to produce a correction signal* and subtracting the correction signal from the digital signal to remove the noise. [M.P.E.P. § 2106 (emphasis added)]

Claim 1 of the present application recites, among other features, a communication encoding method that includes the steps of: obtaining initial binary data having a characteristic Hamming weight; determining the characteristic Hamming weight of the initial binary data; performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and processing the initial binary data based on the comparison *to thereby develop processed binary data* having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. Thus, just as in the digital filtering process example illustrated above, it is respectfully submitted that claim 1 produces a "useful, concrete and tangible result" in the *processed binary data* having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. As discussed in the present application, "the present invention employs an enhancement to the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes." [present application, page 9, paragraph 0019] While such a "useful, concrete and tangible result" can be used in "general purpose computers (e.g., in disk drives, printers, routers, etc.), it is to be understood that the present invention may also find applicability in other noisy channels (e.g., wireless, etc.) and even in other fields such as Internet communications, telecommunications, or any processor-to-processor applications." [present application, page 21 – page 22, paragraph 0053] Therefore, it is respectfully submitted that independent claim 1 defines statutory subject matter.

The Patent Office criticizes the Appellants use of the example provided by the M.P.E.P., and attempts to illustrate why the Appellants interpretation is incorrect. The Patent Office states that "the examples in M.P.E.P. §2106 are carefully crafted examples co [sic; of] claim language for various arts that overcome 101 issues by ensuring elements in the body of the claim *require hardware implementation*." [Final Office Action, page 7, emphasis added]. In regard to what the Patent Office proffers in this regard as a requirement for the method claims, i.e., "hardware implementation", the Patent Office provides absolutely no rule, citation or support for the Patent Office's assertion. In regard to the Patent Office's argument that the examples are carefully crafted examples to show that claims of this nature "require hardware implementation", it is respectfully submitted that the M.P.E.P. does not state such a requirement *anywhere*, and the Patent Office has proffered no such proof to the contrary. Therefore, in regard to claim 1, it is respectfully submitted the Patent Office's argument is completely without merit.

According to M.P.E.P. § 2106, "[i]f a claim defines a useful machine . . . by identifying the physical structure of the machine . . . in terms of its hardware or hardware and software combination, *it defines a statutory product*. [M.P.E.P. § 2106 (citations omitted) (emphasis added)] For example, it is respectfully noted that claim 38 of the present application recites a communication encoding *apparatus* including *a data input* for receiving initial binary data having a characteristic Hamming weight. The apparatus also includes a *processor* in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop *processed binary data* having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. Thus, not only is a "useful, concrete and tangible result" produced by the apparatus, but claim 38 also identifies the physical structure of the machine.

It is respectfully noted that independent claims 118, 128, 155 and 171 also recite the physical structure of the respective machines. Consequently, it is respectfully submitted that claims 118, 128, and 155 also necessarily define statutory products.

The Patent Office then states that:

> the independent claims in the Applicant's [sic] disclosure have preambles with no connection to the body of the claims and that a preamble is generally not accorded any patentable weight where it merely recites the purpose of the intended use of a structure, and where the body of the claims does not depend on the preamble for completeness, but instead, the process steps or structural limitations are able to stand alone. [Final Office Action, page 7]

Respectfully, the Appellants fail to see how this applies to the Appellants' or the Patent Office's arguments, because there is no connection made to any statement provided by the Appellant, and no apparent connection to any argument made by the Patent Office. Furthermore, the Patent Office provides absolutely no support for the assertion that the preamble affects whether the claim is statutory or not. Therefore, such an argument is also without merit.

For at least the foregoing reasons, the rejection of claims 1, 118, 128, and 155 under 35 U.S.C. §101 is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 2-10, 119-127, 129-137 and 156-164 variously depend from independent claims 1, 118, 128 and 155, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 1, 118, 128 and 155.

2. Claims 65-74 and 88-97.

The Appellants respectfully submit that the Patent Office rejection of claims 65 and 88 under 35 U.S.C. § 101 is in error, and respectfully request that the rejection be withdrawn.

Each of independent claims 65 and 88 recites a computer-readable medium "having stored thereon" executable instructions for performing the communication encoding method

according to exemplary embodiments. According to M.P.E.P. § 2106, "[w]hen functional descriptive material is recorded on some computer-readable medium it becomes *structurally and functionally interrelated to the medium* and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized." [M.P.E.P. § 2106 (citing *In re Lowry*, 32 F.3d 1579, 1583-84, 32 U.S.P.Q.2d 1031, 1035 (Fed. Cir. 1994) (*claim to data structure stored on a computer readable medium that increases computer efficiency held statutory*)] In other words, " a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory." [M.P.E.P. § 2106]

As discussed at length herein, exemplary embodiments of the present invention produce a "useful, concrete and tangible result" in the processed binary data. In addition, the executable instructions recited in the body of claims 65 and 88 recite functional descriptive material. "Functional descriptive material" is defined as "data structures and computer programs which impart functionality when employed as a computer component." [M.P.E.P. § 2106] As the executable instructions define functional descriptive material, the executable instructions embodied in the computer-readable medium become "*structurally and functionally interrelated to the medium*," and are, therefore, statutory.

The Final Office Action states that:

> claims 65 and 88 recite no function relating the abstract algorithm in the body of the claims that functionally relates the computer readable medium and in fact *the Applicant admits that there is no functional relationship* in the Applicant's [sic] current arguments (see page 36 of the Applicant's [sic] current filed arguments) stating the computer readable medium *serves only to store* the abstract algorithm. [Final Office Action, pages 9 and 10, emphasis added]

Contrary to what the Patent Office asserts, the Appellants have not admitted that there is no functional relationship, as closer scrutiny of the Appellants comments from page 36 of their response to the First Office Action shows. The Appellants in that document stated that "the computer-readable medium can store the software instructions recited in the body of the

claims. In other words, the computer-readable medium recited in the preamble of these claims is used for storage purposes to store the software instructions, as would be recognized by one of ordinary skill in the art." [Response to First Office Action, page 36, emphasis added] The Appellants note, however, that the phrase "serves only to store" is not only not to be found in the aforementioned quote from the Response to the First Office Action, but cannot be found anywhere in the Response to the First Office Action, as the Appellants made no such statement, nor even a statement that could be interpreted in such a manner.

Furthermore, the Patent Office's assertion that "Applicants admits that there is no functional relationship" is completely and totally without any basis whatsoever. *Nowhere* on the aforementioned page, nor anywhere in the Response to the First Office Action, does the Appellant assert that "there is no functional relationship." Quite to the contrary. It is respectfully submitted that what the Patent Office fails to admit, or recognize the validity of, is that "the storage of the "functional descriptive material" comprising the executable instructions (recited in the body of independent claims 65 and 88) on the computer-readable media would create "structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized." [M.P.E.P. § 2106, emphasis added] In other words, the Appellants assert that the Patent Office is, in this instance, failing to recognize the validity and authority of the M.P.E.P. and merely substituting their own unfounded and baseless beliefs and judgment. Respectfully, if the Patent Office in this instance believes there is case law, or other rules that supercede the authority of the M.P.E.P., the Patent Office should make a showing of their authority.

Finally, the Patent Office asserts that:

> an abstract calculation (say adding 2+2) can only be consider[ed] to produce a 'useful, concrete and tangible result' if the details for producing a 'useful, concrete and tangible result' are recited in connecting with the abstract calculation. As such, the independent claims are only directed to an abstract calculation and do not demonstrate how that abstract calculation is used for producing any 'useful, concrete and tangible result'. [Final Office Action, page 10]

The Patent Office continues to maintain that the Appellants' claims do not produce a "useful, concrete and tangible result," without any attempt to support such a conclusion, or attempting to refute the Appellants arguments, notwithstanding that the claim language itself is clear on its face: "a fourth set of machine-executable instructions for processing the initial binary data based on the comparison *to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.*" One "useful, concrete and tangible result" found in the claims is to "develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data." To not recognize this as a "useful, concrete and tangible result" implies a lack of understanding of the subject matter of the embodiments of the present invention, and a complete and total disregard of patent law in regard to the requirements and mandates of 35 U.S.C. § 101.

For at least the foregoing reasons, the rejection of claims 65 and 88 under 35 U.S.C. § 101 is in error, and the Appellants respectfully request that the rejection be withdrawn.

Dependent claims 66-74 and 89-97 variously depend from independent claims 65 and 88, and are, therefore, patentable for at least those reasons stated above with respect to independent claims 65 and 88.

Hence, the subject matter of these claims is separately patentable for this reason.

E. Rejection of Claims 1-10, 24-33, 38-47, 65-74, 88-97, 102-111, 118-137, 155-164, and 171-180 Under 35 U.S.C. §102(e), as Allegedly Being Anticipated by Nazari.

1. The Nazari Patent.

Nazari discloses a technique to construct 32/33 and other RLL codes in which a thirty three bit word is encoded from a thirty two bit word to conform to RLL coding constraints. A parity bit is added to the coded word after coding is complete. With the parity bit inserted the code satisfies a minimum Hamming weight of nine and no more than eleven consecutive zeros and no more than eleven consecutive zeros in both the odd and even interleaves. A table of "bad" eight bit sequences is used to compare the odd and even interleaves of the right and left halves of the input word that is being encoded. If a "bad" sequence is found, its position in the table points to a second table containing a four bit replacement code that is inserted into the coded output word. Flag bits in the output coded word are set to indicate the violation of the coding constraints and provide a means by which a decoder can be used to reverse the process and obtain the original input word. [*see* Nazari, Abstract]

2. Claims 1-3, 24-26, 38-40, 65-67, 88-90, 102-104, 118-120, 155-157, and 171-173.

The Appellants respectfully submit that Nazari fails to teach or suggest all of the features of the embodiments of the present invention for an encoding and decoding apparatus and method with hamming weight enhancement.

In particular, the Appellant submits that Nazari fails to teach or suggest the features of, for example, determining the characteristic Hamming weight of the initial binary data, and performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, as recited in, for example, independent claim 1 of the present application.

Nazari discloses a method of constructing 32/33 and other RLL codes. For example, Figure 4 of Nazari illustrates "the initial part of the flow diagram for coding a 32 bit word to confirm to RLL restrictions and *produce* a code word that has a minimum Hamming weight of nine, no more than eleven consecutive logical zero's, and no more than eleven consecutive zero's in both even and odd interleaves." [Nazari, column 7, lines 15-21 (emphasis added); *see also* column 5, lines 41-46, discussing the "coding rules for constructing a thirty three bit RLL code word [having] a minimum Hamming weight of nine."]

According to Nazari, a thirty-two bit input code word is subdivided into four eight-bit interleaves: {intLO, intLE, intRO, intRE}. [*see* Nazari, column 5, lines 47-56] Each interleave is compared to Table A, illustrated in Figure 2, to determine if a violation of the coding rules exists. [*see* Nazari, column 5, lines 56-58] "Once a violation is found the position of the 'bad' eight bit word in Table A is used to point to a four bit replacement in Table B." [Nazari, column 5, lines 58-60] As disclosed by Nazari,

> [f]or the right interleaves, intRO, and intRE, the data in the interleaves are directly compared to the eight bit words in Table A, and the four bit word pointed to in Table B is reversed and place into the appropriate right interleave in the output code word OUT. For the left interleaves, intLO and intLE, the data in the interleaves is reversed and compared to the 'bad' eight bit words in Table A and the four bit word pointed to in TABLE B is place into the appropriate left interleave in the output code word OUT. [Nazari, column 5, line 61 – column 6, line 2]

Thus, according to Nazari, subgroups of a code word are compared with values in a table. If "bad" values (i.e., coding rule violations) are found in a subgroup, the appropriate bit sequence (from Table B illustrated in FIGURE 2) is substituted for the offending bits in the given subgroup. The resulting thirty-three output code word that is produced according to Nazari then conforms to the coding rules specified by Nazari, i.e., "there should be no more than eleven consecutive logical zeros in the output word OUT, no more than eleven consecutive logical zeros in both odd and even interleaves and a minimum Hamming weight of nine." [Nazari, column 5, lines 41-46]

In complete contrast to Nazari, an exemplary embodiment of the present invention employs an enhancement to the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes. [*see* present application, page 9, paragraph 0019] According to an aspect of the present invention, such as recited in independent claim 1 of the present application, initial binary data to be communicated or stored is obtained. The characteristic Hamming weight of the initial binary data is determined. The characteristic Hamming weight of the initial binary data is then compared with a predetermined value. The initial binary data is processed based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data. The characteristic Hamming weight of the initial binary data preferably is determined by counting one-valued bits in the initial binary data, and the predetermined value preferably is a predetermined minimum Hamming weight threshold value. Processing of the initial binary data can comprise, for example, bitwise inverting of the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value. [*see* present application, page 9 – page 10, paragraphs 0020 – 0021]

The Patent Office states that:

> [t]he Applicant contends, "[I]n complete contrast to Nazari, *exemplary embodiments of the present invention employ an enhancement to the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes*. According to an aspect of the present invention, such as recited in independent claim 1 of the present application, initial binary data to be communicated or stored is obtained." The Examiner asserts that nowhere in claim 1 does any of the claim language recite 'ECC and RLL encoding processes". In addition, "initial binary data" is only binary data that is initially used before a process, there is nothing in the claim language of claim 1 that requires that the initial binary data be tied to any "ECC and RLL encoding processes." [Final Office Action, pages 10 and 11, emphasis added]

Respectfully, the Appellants are perplexed as to the point of the Patent Office's above cited comments. The Appellants *never stated* that anywhere in claim 1 does any of the language recite "ECC and RLL encoding," only that "*exemplary embodiments of the present*

invention employ an enhancement to the Hamming weight of data prior to encoding to increase the effectiveness of the ECC and RLL encoding processes." The Patent Office's further assertion that there is nothing in the claim language of claim 1 that requires that the initial binary data be tied to any "ECC and RLL encoding processes," is also perplexing in that the Appellants never made such an assertion in their Response to the First Office Action. The Appellants have merely pointed out that, according to the plain, clear language of claim 1, one of the features of claim 1 is that "initial binary data to be communicated or stored is obtained."

The Patent Office then asserts that Nazari teaches the steps of determining the characteristic Hamming weight of the initial binary data and performing a comparison of the characteristic Hamming weight of the initial binary with a predetermined value. Respectfully, the Appellants disagree. The column and lines that the Patent Office refers to describes an end result Nazari ultimately accomplishes, *not* the actual steps of Nazari's process. Instead, one must refer to the above mentioned and described portions of Nazari to learn what Nazari actually teaches or suggest. According to Nazari, a thirty-two bit input code word is subdivided into four eight-bit interleaves: {intLO, intLE, intRO, intRE}, and each interleave is compared to a value in Table A to determine if a violation of the coding rules exists. If there is a violation, the corresponding four bit replacement word is used instead of the "bad" eight bit word. Therefore, the resulting thirty-three output code word that is produced according to Nazari then conforms to the coding rules specified by Nazari, i.e., "there should be no more than eleven consecutive logical zeros in the output word OUT, no more than eleven consecutive logical zeros in both odd and even interleaves and a minimum Hamming weight of nine." [*see*, Nazari, column 5, line 41, through column 6, line 2]

Regarding the 35 U.S.C. §102(e) rejections, it is well known that "[a] claim is anticipated only if *each and every element* as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) [(emphasis added)].

It is respectfully submitted that Nazari does not disclose all of the features of the present invention, including the steps of determining the characteristic Hamming weight of the initial binary data, and performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, as recited, for example, in claim 1 of the present application.

Independent claims 24, 38, 65, 88, 102, 118, 128, 155 and 171 recite features similar to those recited in independent claim 1, and are, therefore, patentably distinguishable over Nazarai for at least those reasons stated above with regard to claim 1.

Dependent claims 2, 3, 25, 26, 39, 40, 66, 67, 89, 90, 103, 104, 119, 120, 156, 157, 172 and 173 variously depend from independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171, and are, therefore, patentably distinguishable over Nazari for at least those reasons stated above with regard to independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155 and 171.

Accordingly, it is respectfully submitted that Nazari does not anticipate claims 1-3, 24-26, 38-40, 65-67, 88-90, 102-104, 118-120, 155-157, and 171-173 of the present invention. Therefore, the rejection of claims 1-3, 24-26, 38-40, 65-67, 88-90, 102-104, 118-120, 155-157, and 171-173 under 35 U.S.C. § 102(e) is in error and should be withdrawn.

3. Claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174, including the step of processing the initial binary data comprises bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

The Patent Office asserts that Nazari, in column 2, lines 29-37, teaches or suggests the step of bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value. The following is the cited section of Nazari:

> [a] table of "bad" eight bit words, such as Table A in FIGURE 2, is established to compare against the eight bit interleaves. The eight bit words in Table A are sometimes called "violations", and Table A was established to facilitate analysis, minimize global constraints, minimize interleave constraints and eliminate low Hamming weights. Table A is used as a pointer to a four bit replacement, shown in Table B in FIGURE 2, for the interleave that is in violation of the coding constraints. [Nazari, column 2, lines 29-37]

Respectfully, nowhere in the cited section of Nazari, nor in any other section of Nazari, does it refer to "bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value." The Patent Office seems to be asserting that because one or more of the bits in the four bit word in Table B, which corresponds to the bad data word found in Table A, happens to be inverted in the corresponding four-bit replacement, this is the same as the Appellants claim feature of the step of "bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value." It is respectfully submitted that a four bit word that is replaced with a bit word in which one or more of the bits might be inverted is *not* the same as the Appellants' claim feature "bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value."

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value, it is respectfully submitted that Nazari does not anticipate dependent claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174 of the present invention.

Therefore, the rejection of claims 4, 27, 41, 68, 91, 105, 121, 131, 158, and 174 under 35 U.S.C. § 102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

4. Claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175, including the feature of processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

The Patent Office asserts that step 13, in Figure 4 of Nazari, is allegedly identical to the claim feature of the step of processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value. Referring to Figure 4, step 13, Nazari teaches that step 13 is a decision step that determines whether all interleaves are valid. Respectfully, the Appellants suggest that this is not the same as supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value. The interleaves disclosed by Nazari are decidedly differently from the "initial binary data" of the Appellants claimed invention. Since "interleaves" are not the same as the "initial binary data," step 13 of Figure 4 of Nazari is not the same as the claimed feature of "supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value."

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value, it is respectfully submitted that Nazari does not anticipate claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175 of the present invention.

Therefore, the rejection of claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175 under 35 U.S.C. § 102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

5. Claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176, including the features of the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

The Patent Office Asserts that Nazari, in steps 15 and 18 shown in Figure 4, are, in combination, the same as the Appellants' claim feature of the "binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise." Respectfully, the Appellants assert that this is not the case. Claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176 variously depend from claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175. Since it has been shown that step 13 of Figure 4 in Nazari does not disclose the Appellants' claimed feature of supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value (see claims 5, 28, 42, 69, 92, 106, 122, 132, 159, and 175), then it is respectfully submitted that the claim feature recited in claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176 is not disclosed by Nazari. In claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176, the binary digit has a first value of the Hamming weight of the *initial binary data* that is less than the predetermined value and having a second value otherwise. Since the interleaving disclosed by Nazari is not "initial binary data," it is respectfully submitted that Nazari does not disclose such a feature.

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of the binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise, it is respectfully submitted that Nazari does not anticipate claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176 of the present invention.

Therefore, the rejection of claims 6, 29, 43, 70, 93, 107, 123, 133, 160, and 176 under 35 U.S.C. § 102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

6. Claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177, including the feature of supplying an indication of whether bits of the processed binary data are inverted.

The Patent Office Asserts that steps 22 and 60, of Figures 5A and 7A, respectively, of Nazari, teach or suggest the claim feature of supplying an indication of whether bits of the processed binary data are inverted. Respectfully, the Appellants suggest that this is simply not the case. Nazari teaches that step 22 is used to indicate that "if there is a violation in the left half 21 of the input thirty two bit word, then out(16) is set to a logical one 22; otherwise 20 out(16)=0 and the process continues (D) in FIGURE 7a." [Nazari, column 7, lines 47-50] Similarly, Nazari teaches that step 60 in Figure 7A is used to indicate that if "the right side violation indicator is set 60, out(18)=1." The Appellants respectfully submit that indicating there is a violation in the left half of the input thirty two bit word, and setting a right side violation indicator, is not identical to the claim feature of the Appellants invention of supplying an indication of whether bits of the processed binary data are inverted.

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of supplying an indication of whether bits of the processed binary data are inverted, it is respectfully submitted that Nazari does not anticipate claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177 of the present invention.

Therefore, the rejection of claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177 under 35 U.S.C. §102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

7. Claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178, including the feature of the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

The Patent Office Asserts that Nazari, in steps 22 and 39 shown in Figure 5A, teaches or suggests the Appellants' claim feature of the "the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise." Respectfully, the Appellants assert that this is not the case. Claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 175 variously depend from claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177. Since it has been shown that steps 22 and 60 shown in Figures 5A and 7A of Nazari are not the same as the Appellants' claim feature of supplying an indication of whether the bits of the processed binary data are inverted (see claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177), then the claim feature recited in claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178, are not disclosed by Nazari. In claims 7, 30, 44, 71, 94, 108, 124, 134, 161, and 177, an indication is supplied if the bits of the processed binary data are inverted. Since indicating that there is a violation in the left half of the input thirty two bit word, and setting a right side violation indicator, as disclosed by Nazari, is not identical to the claim feature of the Appellants invention of supplying an indication of whether bits of the processed binary data are inverted, the claim feature of claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178 are not disclosed by Nazari.

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of the indication comprising a binary digit having a

first value if the bits of the processed binary data are inverted and having a second value otherwise, Nazari does not anticipate claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 175 of the present invention.

Therefore, the rejection of claims 8, 31, 45, 72, 95, 109, 125, 135, 162, and 178 under 35 U.S.C. §102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

8. Claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179, including the features of processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

Respectfully, the Appellants submit that the Patent Office has completely and utterly failed to make any suggestion as to where Nazari discloses the claim feature of processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding. It is respectfully submitted that Nazari does not disclose any such feature.

Therefore, since Nazari does not disclose all of the features of the present invention, including the claim feature of processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding, Nazari does not anticipate claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179 of the present invention.

Therefore, the rejection of claims 9, 32, 46, 73, 96, 110, 126, 136, 162, and 179 under 35 U.S.C. §102(e) is in error and should be withdrawn.

Hence, the subject matter of these claims is separately patentable for this reason.

9. Claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180.

The Appellants submit that since it has been shown that Nazari does not anticipate independent claims 1, 24, 38, 65, 88, 102, 118, 128, 155, and 171, Nazari does not anticipate dependent claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180. The Appellants submit, however, that Nazari also fails to teach or suggest all of the features recited in dependent claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180, including the feature of a symbol boundary of an encoded symbol does not change relative to error correction coding.

Respectfully, the Appellants submit that the Patent Office has utterly and completely failed to make any suggestion as to where in Nazari the claim feature of a symbol boundary of an encoded symbol does not change relative to error correction coding is taught or suggested by Nazari. It is respectfully submitted that Nazari does not disclose any such feature.

Therefore, since Nazari does not teach or suggest all the features of the present invention, including the claim feature of a symbol boundary of an encoded symbol does not change relative to error correction coding, it is respectfully submitted that Nazari does not anticipate claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180 of the present invention.

Therefore, the rejection of claims 10, 33, 47, 74, 97, 111, 127, 137, 163, and 180 under 35 U.S.C. § 102(e) is in error and should be withdrawn.

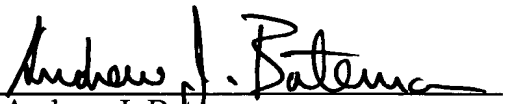
Hence, the subject matter of these claims is separately patentable for this reason.

VIII. Conclusion

For the reasons presented above, the rejections of the claims are not properly founded in the statute and should be reversed.

Respectfully submitted,

KATTEN MUCHIN ROSENMAN LLP

By: 

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APPENDIX

The Appealed Claims

1. A communication encoding method, comprising:

obtaining initial binary data having a characteristic Hamming weight;

determining the characteristic Hamming weight of the initial binary data;

performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

2. The method of claim 1, wherein the characteristic Hamming weight of the initial binary data is determined by counting one-valued bits in the initial binary data.

3. The method of claim 1, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

4. The method of claim 1, wherein processing the initial binary data comprises bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

5. The method of claim 4, wherein processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

6. The method of claim 5, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

7. The method of claim 4, wherein processing the initial binary data further comprises supplying an indication of whether bits of the processed binary data are inverted.

8. The method of claim 7, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

9. The method of claim 1, wherein processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

10. The method of claim 9, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

11. – 23. (Canceled)

24. A method of communicating data from a source to a destination via a channel, the method comprising:

obtaining initial binary data having a characteristic Hamming weight at the source;

determining the characteristic Hamming weight of the initial binary data;

performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data;

conveying the processed binary data from the source to the destination via the channel; and

receiving the processed binary data from the source at the destination and regenerating the initial binary data from the processed binary data.

25. The method of claim 24, wherein the characteristic Hamming weight of the initial binary data is determined by counting one-valued bits in the initial binary data.

26. The method of claim 24, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

27. The method of claim 24, wherein processing the initial binary data comprises bitwise inverting the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

28. The method of claim 27, wherein processing the initial binary data further comprises supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

29. The method of claim 28, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

30. The method of claim 27, wherein processing the initial binary data further comprises supplying an indication of whether bits of the processed binary data are inverted.

31. The method of claim 30, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

32. The method of claim 24, wherein processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

33. The method of claim 32, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

34. – 37. (Canceled)

38. A communication encoding apparatus, comprising:

a data input for receiving initial binary data having a characteristic Hamming weight; and

a processor in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed

binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

39. The apparatus of claim 38, wherein processor determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

40. The apparatus of claim 38, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

41. The apparatus of claim 38, wherein the processor bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

42. The apparatus of claim 41, wherein the processor supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

43. The apparatus of claim 42, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

44. The apparatus of claim 41, wherein the processor further supplies an indication of whether bits of the processed binary data are inverted.

45. The apparatus of claim 44, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

46. The apparatus of claim 38, wherein processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

47. The apparatus of claim 46, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

48. – 64. (Canceled)

65. A computer-readable medium having stored thereon:

a first set of machine-executable instructions for obtaining initial binary data having a characteristic Hamming weight;

a second set of machine-executable instructions for determining the characteristic Hamming weight of the initial binary data;

a third set of machine-executable instructions for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

a fourth set of machine-executable instructions for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

66. The computer-readable medium of claim 65, wherein the second set of machine-executable instructions determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

67. The computer-readable medium of claim 65, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

68. The computer-readable medium of claim 65, wherein the fourth set of machine-executable instructions bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

69. The computer-readable medium of claim 68, wherein the fourth set of machine-executable instructions supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

70. The computer-readable medium of claim 69, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

71. The computer-readable medium of claim 68, wherein the fourth set of machine-executable instructions supplies an indication of whether bits of the processed binary data are inverted.

72. The computer-readable medium of claim 71, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

73. The computer-readable medium of claim 65, wherein processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

74. The computer-readable medium of claim 73, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

75. – 87. (Canceled)

88. A computer-readable medium having stored thereon machine-executable instructions for communicating data from a source to a destination via a channel, the machine-executable instructions comprising:

a first set of machine-executable instructions for obtaining initial binary data having a characteristic Hamming weight at the source;

a second set of machine-executable instructions for determining the characteristic Hamming weight of the initial binary data;

a third set of machine-executable instructions for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

a fourth set of machine executable instructions for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data; and

a fifth set of machine-executable instructions for conveying the processed binary data from the source to the destination via the channel.

89. The computer-readable medium of claim 88, wherein the second set of machine-executable instructions determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

90. The computer-readable medium of claim 88, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

91. The computer-readable medium of claim 88, wherein the fourth set of machine-executable instructions bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

92. The computer-readable medium of claim 91, wherein the fourth set of machine-executable instructions supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

93. The computer-readable medium of claim 92, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

94. The computer-readable medium of claim 91, wherein the fourth set of machine-executable instructions supplies an indication of whether bits of the processed binary data are inverted.

95. The computer-readable medium of claim 94, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

96. The computer-readable medium of claim 88, wherein the fourth set of machine-executable instructions performs at least one of error correction coding, run-length encoding, and precoding.

97. The computer-readable medium of claim 96, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

98. – 101. (Cancelled)

102. A disk drive, comprising:

a data input for receiving initial binary data having a characteristic Hamming weight; and

a processor in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

103. The disk drive of claim 102, wherein processor determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

104. The disk drive of claim 102, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

105. The disk drive of claim 102, wherein the processor bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

106. The disk drive of claim 105, wherein the processor supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

107. The disk drive of claim 106, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

108. The disk drive of claim 105, wherein the processor further supplies an indication of whether bits of the processed binary data are inverted.

109. The disk drive of claim 108, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

110. The disk drive of claim 102, wherein processing the initial binary data comprises performing at least one of error correction coding, run-length encoding, and precoding.

111. The disk drive of claim 110, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

112. – 117. (Canceled)

118. A communication encoding apparatus, comprising:

obtaining means for obtaining initial binary data having a characteristic Hamming weight;

determining means for determining the characteristic Hamming weight of the initial binary data;

comparing means for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

processing means for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

119. The apparatus of claim 118, wherein the determining means determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

120. The apparatus of claim 118, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

121. The apparatus of claim 118, wherein processing means bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the

predetermined value.

122. The apparatus of claim 121, wherein processing means further comprises supplying means for supplying an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

123. The apparatus of claim 122, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

124. The apparatus of claim 121, wherein the processing means further comprises supplying means for supplying an indication of whether bits of the processed binary data are inverted.

125. The apparatus of claim 124, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

126. The apparatus of claim 118, wherein the processing means comprises means for performing at least one of error correction coding, run-length encoding, and precoding.

127. The apparatus of claim 126, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

128. A communication encoding apparatus, comprising:

receiving means for receiving initial binary data having a characteristic Hamming weight; and

processing means in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

129. The apparatus of claim 128, wherein processing means determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

130. The apparatus of claim 128, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

131. The apparatus of claim 128, wherein the processing means bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

132. The apparatus of claim 131, wherein the processing means supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

133. The apparatus of claim 132, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

134. The apparatus of claim 131, wherein the processing means further supplies an indication of whether bits of the processed binary data are inverted.

135. The apparatus of claim 134, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

136. The apparatus of claim 128, wherein the processing means performs at least one of error correction coding, run-length encoding, and precoding.

137. The apparatus of claim 136, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

138. – 154. (Canceled)

155. A disk drive, comprising:

receiving means for receiving initial binary data having a characteristic Hamming weight; and

processing means in communication with the data input for determining the characteristic Hamming weight of the initial binary data, performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value, and processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic Hamming weight of the initial binary data.

156. The disk drive of claim 155, wherein processing means determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the

initial binary data.

157. The disk drive of claim 155, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

158. The disk drive of claim 155, wherein the processing means bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

159. The disk drive of claim 158, wherein the processing means supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

160. The disk drive of claim 159, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

161. The disk drive of claim 158, wherein the processing means further supplies an indication of whether bits of the processed binary data are inverted.

162. The disk drive of claim 161, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

163. The disk drive of claim 155, wherein the processing means comprises means for performing at least one of error correction coding, run-length encoding, and precoding.

164. The disk drive of claim 163, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

165. – 170. (Canceled)

171. A communication encoding apparatus, comprising:

an input for obtaining initial binary data having a characteristic Hamming weight;

a Hamming weight calculator for determining the characteristic Hamming weight of the initial binary data;

a comparator for performing a comparison of the characteristic Hamming weight of the initial binary data with a predetermined value; and

a processor for processing the initial binary data based on the comparison to thereby develop processed binary data having a Hamming weight not less than the characteristic

Hamming weight of the initial binary data.

172. The apparatus of claim 171, wherein the Hamming weight calculator determines the characteristic Hamming weight of the initial binary data by counting one-valued bits in the initial binary data.

173. The apparatus of claim 171, wherein the predetermined value is a predetermined minimum Hamming weight threshold value.

174. The apparatus of claim 171, wherein the processor bitwise inverts the initial binary data if the Hamming weight of the initial binary data is less than the predetermined value.

175. The apparatus of claim 174, wherein the processor further supplies an indication of whether the Hamming weight of the initial binary data is less than the predetermined value.

176. The apparatus of claim 175, wherein the indication comprises a binary digit having a first value if the Hamming weight of the initial binary data is less than the predetermined value and having a second value otherwise.

177. The apparatus of claim 174, wherein the processor further supplies an indication of whether bits of the processed binary data are inverted.

178. The apparatus of claim 177, wherein the indication comprises a binary digit having a first value if the bits of the processed binary data are inverted and having a second value otherwise.

179. The apparatus of claim 171, wherein the processor further performs at least one of error correction coding, run-length encoding, and precoding.

180. The apparatus of claim 179, wherein a symbol boundary of an encoded symbol does not change relative to error correction coding.

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CLM/"based on": 298202 patents.
its 1 through 50 out of 298202

EXHIBIT A

Next 50 Hits

Jump To

Refine Search aclm/("based on")

PAT. NO.	Title
6,910,221	Moving image communication evaluation system and moving image communication evaluation method
6,910,210	System and method for terminating applications
6,910,208	System and method of providing replaceable and extensible user interface for the installation of a suite of applications
6,910,204	Software development methodology including creation of focus areas and decomposition of same to create use cases
6,910,202	Logic synthesis device and logic synthesis method
6,910,198	Method and apparatus for pre-computing and using placement costs within a partitioned region for multiple wiring models
6,910,197	System for optimizing buffers in integrated circuit design timing fixes
6,910,192	Method of robust technology design using rational robust optimization
6,910,188	Viewing changes to a shared document in one object
6,910,187	Graphical user interface for procuring telecommunications services on-line
6,910,183	File tagging and automatic conversion of data or files
6,910,182	Method and apparatus for generating structured documents for various presentations and the uses thereof
6,910,177	Viterbi decoder using restructured trellis
6,910,176	Method for communicating data between digital camera and portable electronic communication device
6,910,175	Encoder redundancy selection system and method
6,910,173	Word voter for redundant systems

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esults of Search in 1976 to present db for:
CLM/"relative to": 477448 patents
its 1 through 50 out of 477448

EXHIBIT B

Next 50 Hits

Jump To

Refine Search aclm/"relative to"

PAT. NO.	Title
6,910,218	Slim type optical disc drive
6,910,194	Systems and methods for timing a linear data path element during signal-timing verification of an integrated circuit design
6,910,186	Graphic chatting with organizational avatars
6,910,171	Lossy compression of stakes in turbo decoder
6,910,147	Digital recording apparatus real-time clock
6,910,146	Method and apparatus for improving timing margin in an integrated circuit as determined from recorded pass/fail indications for relative phase settings
6,910,116	Game disk layout
6,910,106	Methods and mechanisms for proactive memory management
6,910,097	Classless interdomain routing using binary content addressable memory
0 6,910,078	Methods and apparatus for controlling the transmission of stream data
1 6,910,031	Data search system and method for displaying data search results
2 6,910,021	Financial management system including an offset payment process
3 6,910,013	Method for identifying a momentary acoustic scene, application of said method, and a hearing device
4 6,909,989	Method and system for establishing operational stability prior to determining temperature correction factors for a generator
5 6,909,988	Method for positioning defects in metal billets
6 6,909,971	Method for gene mapping from chromosome and phenotype data
7 6,909,965	System and method for creating and organizing node records for a cartographic data map
8 6,909,959	Torque distribution systems and methods for wheeled vehicles